Syllabus for Screening Test

for

Shortlisting number of candidates

for

Various teaching posts in schools established

by the

Society for Promotion of Quality Education for Poor and Meritorious Students of Punjab.

State Council of Educational Research and Training, Punjab
Website:www.scertpunjab.ac.in

English

a) Critical and historical understanding of

- **Indian English Writers:** R.k.Narayan, Rajarao, Arundhati Roy, Khushwant Singh, Mulk Raj Anand, Anita Desai, Rabindranath Tagore, Sarojini Naidu,
- **Jacobean to Restoration**: John Donne, John Milton,
- **Augustan Age**: Alexander Pope, Jonathan Swift, Joseph Addison, Samuel Richardson, Henry Fielding
- **Romantic Period**: William Blake, William Wordsworth, Samuel Taylor Coleridge, Lord Byron, P.B. Shelley, John Keats, Dorothy Wordsworth Jane Austen, Sir Walter Scott, Mary Shelley, Mathew Gregory Lewis.
- **Victorian Period**: Alfred, Lord Tennyson, Robert Browning, E.B. Browning, Thomas Carlyle, John Ruskin, Walter Pater, Florence Nightingale, Charlotte Bronte, Emily Bronte, Charles Dickens, Thomas Hardy,
- **Modern Period**: T.S. Eliot, Virginia Woolf, Joseph Conrad, James Joyce, E. M. Forster, D.H. Lawrence, W. B. Yeats, George Bernard Shaw.
- **Contemporary Period**: Philip Larkin, Ted Hughes, Stevie Smith, Seamus Heaney, Eavan Boland, George Orwell, William Golding, Doris Lessing, Graham Greene, Salman Rushdie, V.S. Naipaul, Stephen Leacock.
- **Literary Terms**

b) Grammar and Linguistics

- Phrase structure rule, Transformational generative grammar (with reference to Chomsky), Transformational rule, a brief introduction to Semitic languages, sociolinguistics, language variety, dialect, accent and register, psycholinguistics nature and application, behaviorist, cognitive and mental views of language learning, individual differences
- Linguistics (sign, speed and writing, anthropologist, organ of speech, description and classification of sounds, morphology and word formation.

Biology

Unit I Diversity in Living World

- **Biology-** its meaning of relevance to mankind
- **Taxonomy** – Concept of species and taxonomical hierarchy
- **Systematic** – Introduction to plant Systematic, its aims , objectives and importance , classification , brief history , introduction , various systems of classification of living organism   [Two kingdom system , five kingdom system) Brief introduction to nomenclature and binomial system of nomenclature
- **Salient features and classification of kingdom Monera** (including Archaebacteria and cyno bacteria) General structure ,occurrence ,reproduction and economics importance.
- **Kingdom protista**- General structure ,occurrence , reproduction and economic importance
- **Kingdom Fungi**- General structure, occurrence, reproduction and economic importance, diseases of economically important crop plant , rusts , smuts, downy and powdery mildew damping off.
- **Kingdom Plantae**- salient features and classification of plants into major groups.
  Algae- General account, structure, life cycle of biological importance of green algae, brown algae and red algae .
  Bryophytes- General account , structure, life cycle and economic importance of liverworts and mosses.
- **Pteridophytes-** General account , structure, classification, life cycle and economic importance.
- **Gymnosperms**- General account , structure, classification life cycle and economic importance.
- **Angioperms**- classification up to class ,General account , structure, life cycle and economic importance.
  Viruses- General structure, types and reproduction of viruses
  Lichens- General account ,structure and life history.
- **Kingdom Animalia** – salient features (in the reference to habitat , habits morphology and economic importance)and classification of non chordates up to phylum level.
  Salient features (in the reference to habitat , habits, morphology and economic importance) classification of chordates up to class level.

Unit II Structural organization in plants

- **Tissue** ,Tissue system in plants
- **Morphology**, function and modification of root , stem and leaf

- **Anatomy** of root , stem and leaf , primary and secondary growth in dicot stem
- **Inflorescence**, Types of Inflorescence, flower (including postion and arrangement of different whorls) placentation , fruit, types of fruit, seed.
- Diagnostics features, economic importance and distribution pattern of Angiospermic families
  A) Family Brassicaceae
  B) Family Fabaceae
  C) Family solnaceae
  D) Family Liliaceae
  E) Family Poaceae

Unit III Plant Physiology

Transport in Plants - Movement of water (including diffusion ,osmosis, plasmolysis and water relations of cell) and nutrients, long distant of water – absorption, apoplast , symplast , transpiration pull, root pressure and guttation , transpiration opening and closing of stomata, uptake and translocation of mineral nutrients- Transport of food ,phloem transport , mass flow hypothesis.

Mineral Nutrition – Essential minerals , macro and micro nutrients and their role , deficiency symptons , Mineral toxicity, Elementary idea of hydroponics as a method to study mineral nutrition.

Nitrogen Metabolism - Biological nitrogen fixation , Nitrogen cycle.

Photosynthesis - Photosynthesis as means of autotrophic nutrition, pigments involved in Photosynthesis , absorption and action spectra , photochemical and biosynthetic phases of Photosynthesis , photophosphorylation : cyclic and non cyclic of photophosphorylation, chemiosmotic hypothesis, photorespiration, factors affecting Photosynthesis.

Respiration- Aerobic respiration : Glycolysis; Kerbs's cycle Electron transport chain and oxidative phosphoryation , Anaerobic respiration , respiratory substance and respiratory quotient

Plant Growth and development – phases of plant growth and plant growth rate , canditions of growth , Differentiation, and dedifferentiation, Redifferentiation Growth regulators – Role of auxins, gibberdlin, cytokinin, ethylene, abscissic acid photoperiodism, role of phytochrome and harmones in photoperiodism, Dormancy, methods of breaking seed dormancy, vernalization.

Plant movements- Tropic movements ,phototropism ,gravitropism and their mechanism, Nastic movements.

Unit IV Strutural organization in Animals

-Tissue in animals

- Morphology, anatomy and function of different systems (digestive, circulatory respiratory nervous and reproductive)
of earthworm, frog and an insect (Cockroach)

Unit V   Animal Physiology

Human   Physiology

Digestion and absorption :- Alimentary canal and digestive glands , role of digestive enzymes and gastrointestinal harmones , digestion, absorption and assimilation of proteins carbohydrates and fats, egestion , nutrition and digestive disorders.

Breathing and respiration – respiratory organs in human beings , Mechanism of Breathing and its regulation in human, Transport of respiratory gases, Respiratory volumes , respiratory disorders **.**

Circulation

Composition of Blood , Blood groups, coagulation of blood , composition of lymph and its functions , structure of human heart and blood vessels , Cardiac cycle, Cardiac output, ECG , double circulation , Disorders of circulatory systems .

Excretion- Modes of excretion, structure and function of excretory system , Urine formation , osmoregulation, Regulation of kidney function , Renin- angiotensin , role of other organs in excretion , Disorders of excretory system.

- **Locomotion and Movement** ;- Types of movement , Skeletal muscle – contractile proteins and muscle contraction , skeletal system and its function , joints. Disorders of muscular and skeletal system   **Neural control and coordination**: Neuron and nerves; Nervous system in humans- central nervous system, peripheral nervous system and visceral nervous system; Generation and conduction of nerve impulse; Reflex action; Sense organs; Elementary structure and function of eye and ear.
- **Chemical coordination and regulation:** Endocrine glands and hormones; Human endocrine system-Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action (Elementary Idea); Role of hormones as messengers and regulators, Hypo-and hyperactivity and related disorders (Common disorders e.g. Dwarfism)

Unit VI Reproduction

Reproduction in organisms: Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction – Asexual and sexual; Asexual reproduction; Modes-Binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants.

Sexual reproduction in flowering plants: Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreeding devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events-Development of endosperm and

embryo, Development of seed and formation of fruit; Special modes-apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation.

Human Reproduction: Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis-spermatogenesis & oogenesis; Menstrual cycle; Fertilisation, embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elementary idea).

Reproductive health: Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control-Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies – IVF, ZIFT, GIFT (Elementary idea for general awareness).

Unit VII Cell biology, genetics and Evolution.

Structure and function of bio molecules : Carbohydrates,lipids proteins, and nucleic acid.
Enzymes- types,properties,functions and enzymes action
Cell-physico-chemical nature of plasma membrane , cell wall.
Ultra structure of cell organelles with brief description and functions.
1. Endoplasmicreticulum, golgibodies, lysosome, vacuoles, mitochondria, ribosomes, plastids, cilia, flagella, centrioles nucleolus.
2. Cell division : cell cycle, mitosis , meiosis and their significance.

Heredity and variation: Mendelian Inheritance; Deviations from Mendelism-Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex determination-In humans, birds, honey bee; Linkage and crossing over; Sex linked inheritance-Haemophilia, Colour blindness; Mendelian disorders in humans-Thalassemia; Chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

- Molecular basis of Inheritance: Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation-Lac Operon; Genome and human genome project; DNA finger printing.

- Evolution: Origin of life; Biological evolution and evidences for biological evolution from Paleontology, comparative anatomy, embryology and molecular evidence); lamarcks theory of evolution Darwin's contribution, Modern Synthetic theory of Evolution; Mechanism of evolution-Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy-Weinberg's principle; Adaptive Radiation; Human evolution.

UNIT VIII Biology and Human Welfare
Health and Disease; Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis. Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology-vaccines; Cancer, HIV and AIDS; Adolescence, drug and alcohol abuse.

- Improvement in food production; Plant breeding, tissue culture, single cell protein, Biofortification; Apiculture and Animal husbandry.

- Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

UNIT IX Biotechnology and Its Applications
- Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology).

- Application of Biotechnology in health and agriculture: Human insulin and vaccine production, gene therapy; Genetically modified organisms-Bt crops; Transgenic Animals; Biosafety issues-Biopiracy and patents.

UNIT X Ecology and environment
- Organisms and environment: Habitat and niche; Population and ecological adaptations; Population interactions-mutualism, competition, predation, parasitism; Population attributes-growth, birth rate and death rate, age distribution.

- Ecosystem: Patterns, components; productivity and decomposition; Energy flow; Pyramids of number, biomass, energy; Nutrient cycling (carbon and phosphorous); Ecological succession; Ecological Services-Carbon fixation, pollination, oxygen release. Biogeochemical cycle

- Biodiversity and its conservation: Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; Biodiversity conservation; Hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, National parks and sanctuaries.

- Environmental issues: Air pollution and its control; Water pollution and its control; Agrochemicals and their effects; Solid waste management; Radioactive waste management; Greenhouse effect and global warning; Ozone depletion; Deforestation; Any three case studies as success stories addressing environmental issues.

PHYSICS

I. Mathematical Methods of Physics

Dimensional analysis; Vector algebra and vector calculus; Linear algebra, matrices, Cayley Hamilton theorem, eigenvalue problems; Linear differential equations; Special functions (Hermite, Bessel, Laguerre and Legendre); Fourier series, Fourier and Laplace transforms; Elements of complex analysis: Laurent series-poles, residues and evaluation of integrals; Elementary ideas about tensors; Introductory group theory, SU(2), O(3); Elements of computational techniques: roots of functions, interpolation, extrapolation, integration by trapezoid and Simpson's rule, solution of first order differential equations using Runge-Kutta method; Finite difference methods; Elementary probability theory, random variables, binomial, Poisson and normal distributions.

II. Classical Mechanics

Newton's laws; Phase space dynamics, stability analysis; Central-force motion; Two-body collisions, scattering in laboratory and centre-of-mass frames; Rigid body dynamics, moment of inertia tensor, non-inertial frames and pseudoforces; Variational principle, Lagrangian and Hamiltonian formalisms and equations of motion; Poisson brackets and canonical transformations; Symmetry, invariance and conservation laws, cyclic coordinates; Periodic motion, wave motion, small oscillations and normal modes; Special theory of relativity, Lorentz transformations, relativistic kinematics and mass–energy equivalence, work power energy, gravitation, pressure, motion of fluids, viscosity, surface tension.

III. Electromagnetic Theory

Electrostatics: Gauss' Law and its applications; Laplace and Poisson equations, boundary value problems; Magnetostatics: Biot-Savart law, Ampere's theorem, electromagnetic induction; Maxwell's equations in free space and linear isotropic media; boundary conditions on fields at interfaces,; Scalar and vector potentials; Gauge invariance; Electromagnetic waves in free space, dielectrics, and conductors; Reflection and refraction, polarization, optical instrument, defects of eye. Fresnel's Law, interference, coherence, and diffraction; Dispersion relations in plasma; Lorentz invariance of Maxwell's equations; Transmission lines and wave guides; Dynamics of charged particles in static and uniform electromagnetic fields; Radiation from moving charges, dipoles and retarded potentials, **current electricity-**Kirchhoff's Law, Wheat Stone Bridge, Potentio meter & Slide Wire Bridge.

IV. Quantum Mechanics

Wave-particle duality; Wave functions in coordinate and momentum representations; Commutators and Heisenberg's uncertainty principle; Matrix representation; Dirac's bra and ket notation; Schroedinger equation (time-dependent and time-independent); Eigenvalue problems such as particle-in-a-box, harmonic oscillator, etc.; Tunneling through a barrier; Motion in a central potential; Orbital angular momentum, Angular momentum algebra, spin; Addition of angular momenta; Hydrogen atom, spin-orbit coupling, fine structure; Time-independent perturbation theory and applications; Variational method; WKB approximation;

Time dependent perturbation theory and Fermi's Golden Rule; Selection rules; Semi-classical theory of radiation; Elementary theory of scattering, phase shifts, partial waves, Born approximation; Identical particles, Pauli's exclusion principle, spin-statistics connection; Relativistic quantum mechanics: Klein Gordon and Dirac equations.

V. Thermodynamic and Statistical Physics

Laws of thermodynamics and their consequences; Thermodynamic potentials, Maxwell relations; Chemical potential, phase equilibria; Phase space, micro- and macrostates; Microcanonical, canonical and grand-canonical ensembles and partition functions; Free Energy and connection with thermodynamic quantities; First- and second-order phase transitions; Classical and quantum statistics, ideal Fermi and Bose gases; Principle of detailed balance; Blackbody radiation and Planck's distribution law; Bose-Einstein condensation; Random walk and Brownian motion; Introduction to non-equilibrium processes; Diffusion equation.

VI. Electronics and Experimental methods

Semiconductor device physics, including diodes, junctions, transistors, field effect devices, homo and heterojunction devices, device structure, device characteristics, frequency dependence and applications; Optoelectronic devices, including solar cells, photodetectors, and LEDs; High-frequency devices, including generators and detectors; Operational amplifiers and their applications; Digital techniques and applications (registers, counters, comparators and similar circuits); A/D and D/A converters; Microprocessor and microcontroller basics, Logic gates, communication system.

Data interpretation and analysis. Precision and accuracy. Error analysis, propagation of errors. Least squares fitting.

VII.   Experimental Techniques and data analysis

Data interpretation and analysis; Precision and accuracy, error analysis, propagation of errors, least squares fitting, linear and nonlinear curve fitting, chi-square test; Transducers (temperature, pressure/vacuum, magnetic field, vibration, optical, and particle detectors), measurement and control; Signal conditioning and recovery, impedance matching, amplification (Op-amp based, instrumentation amp, feedback), filtering and noise reduction, shielding and grounding; Fourier transforms; lock-in detector, box-car integrator, modulation techniques.

Applications of the above experimental and analytical techniques to typical undergraduate and graduate level laboratory experiments.

VIII. Atomic & Molecular Physics

Quantum states of an electron in an atom; Electron spin; Stern-Gerlach experiment; Spectrum of Hydrogen, helium and alkali atoms; Relativistic corrections for energy levels of hydrogen; Hyperfine structure and isotopic shift; width of spectral lines; LS & JJ coupling; Zeeman, Paschen Back & Stark effect, Photoelectric effect, X-ray spectroscopy; Electron spin resonance, Nuclear magnetic resonance, chemical shift; Rotational, vibrational, electronic, and Raman spectra of diatomic molecules; Frank − Condon principle and selection rules; Spontaneous and stimulated emission, Einstein A & B coefficients; Lasers, optical pumping, population inversion, rate equation; Modes of resonators and coherence length.

IX.   Condensed Matter Physics

Bravais lattices; Reciprocal lattice, diffraction and the structure factor; Bonding of solids; Elastic properties, phonons, lattice specific heat; Free electron theory and electronic specific heat; Response and relaxation phenomena; Drude model of electrical and thermal conductivity; Hall effect and thermoelectric power; Diamagnetism, paramagnetism, and ferromagnetism; Electron motion in a periodic potential, band theory of metals, insulators and semiconductors; Superconductivity, type − I and type - II superconductors, Josephson junctions; Defects and dislocations; Ordered phases of matter, translational and orientational order, kinds of liquid crystalline order; Conducting polymers; Quasicrystals.

X.   Nuclear and Particle Physics

Basic nuclear properties: size, shape, charge distribution, spin and parity; Binding energy, semi-empirical mass formula; Liquid drop model; Fission and fusion; Nature of the nuclear force, form of nucleon-nucleon potential; Charge-independence and charge-symmetry of nuclear forces; Isospin; Deuteron problem; Evidence of shell structure, single- particle shell model, its validity and limitations; Rotational spectra; Elementary ideas of alpha, beta and gamma decays and their selection rules; Nuclear reactions, reaction mechanisms, compound nuclei and direct reactions; Classification of fundamental forces; Elementary particles (quarks, baryons, mesons, leptons); Spin and parity assignments, isospin, strangeness; Gell-Mann-Nishijima formula; C, P, and T invariance and applications of symmetry arguments to particle reactions, parity non-conservation in weak interaction; Relativistic kinematics.

Chemistry

Physical Chemistry

1. **Basic principles of chemistry**:- Importance of chemistry, Nature of Matter, Properties of Matter and their measurement, Uncertainty in measurements, Laws of chemical combinations, Dalton's Atomic Theory, Atomic and Molecular Masses,Mole concept and molar masses Percentage Composition, Stoichiometry and Stoichiometric Calculations

2. **Atomic structure:-** Sub atomic Particles, Atomic models, Developments Leading to the Bohr's model of atom, Bohr's Model for hydrogen atom, towards Quantum Mechanical model of the Atom, Quantum mechanical model of Atom, Nature of electromagnetic radiation, photoelectric effect limitations of Bohr's model, Dual nature of matter, de-Broglie's relationship, Heisnberg uncertaintiy principle, various quantum numbers(principal, angular momentum and magnetic quantum numbers) and their significance, shapes of s,p and d – orbitals, electron spin quantum number, Rules for filling electrons in orbitals-aufbau principle , Paulli's exclusion principle and Hund's rule, electronic configuration of elements, extra stability of half- filled and completely filled orbitals.

3. **States of Matter:-**Intermolecular Forces,Thermal Energy, Intermolecular forces vs thermal interactions, The Gascous state, The Gas laws, Ideal gas equation, Kinetic Molecular theory of Gases, Liquification of Gases, Liquid state

4. **Chemical Bonding and Molecular Structure:-**Kossel – Lewis approach to chemical bond formation, concept of ionic and covalent bonds, Ionic Bonding, Formation of Ionic bonds, factors affecting the formation of ionic bonds, calculation of lattice enthalpy, Covalent Bonding, Concept of electronegetavitiy, Fajan's rule, dipole moment, Valence Shell Electron Pair Repulsion(VSEPR) theory and shapes of simple molecules, Quantum mechanical approach to covalent bonding , Valence bond theory – its important features, concept of hybridization involving s,p and d orbitals, Resonance, Molecular Orbital Theory ,LCAOs , types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbitals electronic configurations of homonuclear diatomic molecules, concept of bond order, bond length and bond energy , Elementary idea of metallic bonding , Hydrogen bonding and its applications.

5. **Basic principles and applications of spectroscopy:-** Rotational, vibrational, electronic, Raman, ESR, NMR

6. **Thermodynamics:-** Fundamental of thermodynamics , System and surroundings, extensive and intensive properties, state functions, types of processes, First law of thermodynamics ,concept of work, heat internal energy and enthalpy , heat capacity, molar heat capacity, Hess's law of constant heat summation , Enthalpies of bond dissociation, combustion ,formation, atomization,sublimation , phase transition, hydration, ionisationand solution. Second law of thermodynamics, Spontaneity of processes, ΔS of the universe and ΔG of the s system as criteria for spontaneity, ΔG^o (standard Gibbs energy change) and equilibrium constant.

7.   Equilibrium:- Meaning of equilibrium, concept of dynamic equilibrium. Equilibria involving physical processes: Solid - liquid, liquid - gas and solid - gas equilibria, Henry's law, general characterics of equilibrium involving physical processes. Equilibria involving chemical process: Law of chemical equilibrium, equilibrium constants (Kp and Kc) and their significance, significance of ΔG and ΔG^o in chemical equilibria, factors affecting equilibrium concentration, pressure, temperature, effect of catalyst; Le Chatelier's principle. Ionic equilibrium: Weak and strong electrolytes, ionization of electrolytes, various concepts of acids and bases (Arthenius Bronsted - Lowry and Lewis) and their ionization, acid - base equilibria (including multistage ionization) and ionization constants, ionization of water, pH scale, common ion effect, hydrolysis of salts and pH of their solutions, solubility of sparingly soluble salts and solubility products, buffer solutions.

8.   Redox Reactions and Electrochemistry:- Electronic concept of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number balancing of redox reactions. Eectrolytic and metallic conduction, conductance in electrolytic solutions, specific and molar conductivities and their variation with concentration: Kohlrausch's law and its applications. Electrochemical cells - Electrolytic and Galvanic cells, different types of electrodes, electrode potentials including standard electrode potential, half-cell and cell reactions, emf of a Galvanic cell and its measurement; Nernst equation and its applications; Relationship between cell potential and Gibbs' energy change, Dry cell and lead accumulator; Fuel cells.

9.   Chemical Kinetics:- Rate of a chemical reactions, factors affecting the rate of reactions: concentration, temperature, pressure and catalyst; elementary and complex reactions, order and molecularity of reactions, rate law, constant and its units, differential and integral forms of zero and first order reactions, their characteristics and half-lives, effect of temperature on rate of reactions - Arrhenius theory, activation energy and its calculation, collision theory of bimolecular gaseous reactions (no derivation).

10.   Surface chemistry:- Adsorption - Physisorption and chemisorptions and their characteristics, factors affecting adsorption of gases on solids - Freundlich and Langmuir adsorption isotherms, adsorption from solutions, Colliodal state - distinction among true solutions, colloids and suspensions, classification of colloids - lyophilic, lyophobic; multi molecular, macromolecular and associated colloids (micelles), preparation and properties of colloids - Tyndall effect, Brownian movement, electrophoresis, dialysis, coagulation and flocculation; Emulsions and their characteristics.

11.   Solid States-: General Characteristics of solid state, Amorphous and Crystalline Solids, Classification of Crystalline Solids, Crystal Lattices and Unit Cell, Close-Packed Structures, Packing Efficiency, Calculations Involving Unit Cell Dimensions, Imperfections in Solids, Electrical Properties, Magnetic Properties.

12.   Concepts of catalysis:- Homogenous and heterogeneous catalysis,

13.   Solutions:- Types of Solutions, Expressing concentration of solutions, Solubility, Vapour pressure of liquid solutions, Ideal and Non-ideal solutions, Colligative Properties and Determination of Molar Mass, Abnormal Molar Masses

Inorganic Chemistry

1. **Chemical periodicity:-** Modern periodic law and present form of the periodic tables, s, p, d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

2. **General principles & process of isolation of metals:-** Modes of occurrence of elements in nature, minerals, ores; Steps involved in the extraction of metals - concentration, reduction (chemical and electrolytic methods) and refining with special reference to the extraction of Al, Cu, Zn and Fe; Thermodynamic and electrochemical principles involved in the extraction of metals.

3. **Hydrogen:-** Position of hydrogen in periodic table, isotopes, preparation, properties and uses of hydrogen; Physical and chemical properties of water and heavy water, Structure preparation, reactions and uses of hydrogen peroxide; Hydrogen as a fuel.

4. **S-Block elements:-** Group-1 and 2 elements introduction, electronic configuration and general trends in physical and chemical properties of elements, anomalous properties of the first element of each group, diagonal relationships. Preparation and properties of some important compounds - sodium carbonate and sodium hydroxide; Industrial uses of lime, limestone Plaster of Paris and cement; Biological significance of Na, K, Mg and Ca.

5. **P-Block elements:-** Group 13 to Group 18 elements, Electronic configuration general trends in physical and chemical properties of elements across the periods and down the group; unique behavior of the first element in each group. Preparation, properties and uses of boron and aluminium; properties of boric acid, diboron, boron trifluride, aluminium chloride and alums, Allotropes of carbon, catenation; Structure & properties of silicates and zeolites. Properties and uses of nitrogen and phosphorus; Allotrophic forms, structure and uses of ammonia, nitric acid, and PCl3, PCl5; Structures of oxides of phosphorus. Preparation, properties, structures and uses of ozone; Allotropic forms of sulphur, sulphuric acid and structures of oxoacids of sulphur.

6. **d-&f Block elements:-** Position in periodic table, electronic configurations of d-block elements, general properties of the transition elements (d-Block), some important compounds of transition elements, the lanthanoids, the actinoids, some application of d- and f-Block elements. Preparation, properties and uses of K2 Cr2O7 and KMnO4.

7. **Co-ordination compounds & Organometallic compounds:-** Introduction to co-ordination compounds, Werner's theory; ligands, co-ordination number, denticity, chelation; IUPAC nomenclature of mononuclear co-ordination compounds, isomerism; Bonding - Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties; Importance of co-ordination compounds (in qualitative analysis, extraction of metals and in biological systems), Organmetallic comounds-synthesis, bonding and structure, and reactivity. Organometallics in homogenous catalysis. Cages and metal clusters.

8. **Environmental Chemistry:-** Environmental pollution - Atmospheric, water and soil, Atmospheric pollution - Tropospheric and Stratospheric Tropospheric pollutants - Gaseous pollutants : Oxides of carbon, nitrogen and sulphur, hydrocarbons; their sources, harmful effects and prevention; Green house effect and Global warming; Acid rain; Particulate pollutants: Smoke, dust, smog, fumes, mist; their sources, harmful effects and prevention. Stratospheric pollution - Formation and breakdown of ozone, depletion of ozone layer - its mechanism and effects. Water Pollution - Major pollutants such as, pathogens, organic wastes and chemical pollutants; their harmful effects and prevention. Soil pollution - Major pollutants such as : Pesticides (insecticides, herbicides and fungicidies), their harmful effects and prevention. Strategies to control environmental pollution.

9. **Nuclear Chemistry:-** Nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis.

10. **Analytical chemistry:-** Separation techniques, Spectroscopic electro and thermoanalytical methods.

11. **Bioinorganic Chemistry:-** Photosystems, porphyrines, metalloenzymes, oxygen transport, electron transfer reactions, nitrogen fixation.

12. Physical characterization of inorganic compounds by IR, Raman, NMR, EPR, Mossbauer, UV-, NQR, MS, electron spectroscopy and microscopic techniques.

Organic Chemistry

1. **Purification & Characterisation of organic compounds:-** Purification – Crystallization, sublimation, distillation, differential extraction and chromatography – principles and their applications. Qualitative analysis – Detection of nitrogen, sulphur, phosphorus and halogens. Quantitaive analysis– Estimation of carbon, hydrogen, nitrogen, halogens, sulphur, phosphorus. Calculations of empirical formulae and molecular formulae; Numerical problems in organic quantitative analysis.

2. **Some basic principles of organic chemistry:-** Tetravalency of carbon – Shapes of simple molecules – hybridization (s and p); Classification of organic compounds based on functional groups :- C = C -, -Carbon Carbon triple bond and those containing halogens, oxygen, nitrogen and sulphur, Homologus series; Isomerism –structuraland stereoisomerism. Nomenclature (Trivial and IUPAC) Covalent bond – Homolytic and heterolytic : free radicals, carbocations and carbanions; stability of carbocations and free radicals, eleectrophiles and nucleophiles. Electronic displacement in a covalent bond – Inductive effect, electromeric effect, resonance and hyperconjugation.

3. **Chemistry of Hydrocarbon:-** Classification, Isomersim IUPAC nomenclature, general methods of preparation, properties and reactions. Alkanes – Conformations : Sawhorse and Newman projections (of ethane); Mechanism of halogenations of alkanes. Alkenes – Geometrical isomerism; Mechanism of electrophilic addition: addition of hydrogen,

halogens, water hydrogen halides (Markownikofff's and peroxide effect); Ozonolysis and polymerization. Alkynes – Acidic character, Addition of hydrogen, halogens, water and hydrogen halides; Polymerization. Aromatic hydrocarbons – Nomenclature, benzene – structure and aromaticity: Mechanism of electrophillic substitution: halogenations, nitration, Friedel – Craft's alkylation and acylation, directive influence of functional group in mono – substituted benzene.

4. **Organic compounds – containing Halogens:-** General methods of preparation, properties and reactions; Nature of $C-X$ bond; Mechanisms of substitution reactions, Uses; Environmental effects of chloroform & iodoform.

5. **Organic compounds – containing Oxygen:-** General methods of preparation, properties, reactions and uses. Alcohols, Phenols and Ethers Alcohols: Identification of primary, secondary and tertiary alcoholos; mechanism of dehydration. Phenols: Acidic nature, electrophillic substitution reactions : halogenations, nitration and sulphonation, Reimer – Tiemann reaction. Ethers : Structure. Aldehyde and ketones : Nature of carbonyl group ; Nucleophilic addition to $>C=O$ group, relative reactivities of aldehydes and ketones: Important reactions such as – Nucleophilic addition reactions (addition of HCN, NH3 and its derivatives), Grignard reagent; oxidation; reduction (Wolff Kishner and Clemmensen); acidity of hydrogen, aldol condensation, Cannizzaro reaction, Haloform reaction; Chemical tests to distinguish between aldehydes and Ketones. Methods of preparation properties, reactions and uses of carboxylic acids, acidic strength and factors affecting it.

6. **Organic compounds – containing Nitrogen:-** General methods of preparation, properties, reactions and uses. Amines: Nomenclature, classification, structure, basic character and identification of primary, secondary and tertiary amines and their basic character. Diazonium salts: Importance in synthetic organic chemistry.

7. **Polymers:-** General introduction and classification of polymers, general methods of polymerization – addition and condensation, copolymerization; Natural and synthetic rubber and vulcanization; some important polymers with emphasis on their monomers and uses – polythene, nylon, polyester and bakelite.

8. **Biomolecules:-**General introduction and importance of biomolecules. Carbohydrates- Classification : aldoses and ketoses; monosaccharides and constituent monosaccharides of oligosaccharides, starch. Proteins – primary, secondary, tertiary and quaternry structure (qualitative ides only), denaturation of proteins, enzymes. Vitamins – Classification and functions. Nucleic Acids – Chemical constitution of DNA and RNA. Biological functions of nucleic acids.

9. **Chemistry in Everyday Life:-** Chemical in medicines – Analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamins – their meaning and common examples. Chemical in food – Preservatives, artificial sweetening agents – common examples. Cleansing agents – Soaps and detergents, cleansing action.

10. Common reagents (organic, inorganic and organometallic) in organic synthesis.
11. Selective organic transformations – chemoselectivity, regioselectivity, steroselectivity, enatioselectivity. Protecting groups.
12. Physical characterization of organic compounds by IR, UV-, MS and NMR.
13. Principles related to Practical Chemistry.

MATHEMATICS

UNIT – 1

Analysis: Elementary set theory, Sets:

Sets and their representations. Empty set, Finite & Infinite sets, Equal sets. Subsets, Subsets of the set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set, Properties of complement sets.

Finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum.

Sequence and series:

Sequence and Series, Arithmetic Progression (A.P), Arithmetic Mean (A.M), Geometric Progression (G.P), general term of a G.P, sum of n terms of a G.P . Arithmetic and Geometric series, infinite G.P. and its sum. Geometric mean (G .M), relation between A.M and G.M, Sum to n term of the special series $\sum n, \sum n^2$ and $\sum n^3$. Convergence,. Sequences and series of functions, uniform convergence.

Binomial Theorem:

History, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, general and middle term in binomial expansion, simple applications. Bolzano Weierstrass theorem, Heine Borel theorem.

Continuity and Differentiability:
Continuity, uniform continuity. Continuity and Differentiability, derivative of composite functions, chain rule, derivative of inverse trigonometric functions, derivative of implicit function.

Concepts of exponential and logarithmic functions. Derivatives of $\log_e x$ and e^x. Logarithmic differentiation. Derivative of functions expressed in parametric forms.

Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations.

Applications of Derivatives:

Applications of derivatives: rate of change, increasing/decreasing functions, tangents and normal, approximation, maxima and minima. Simple problems (that illustrate basic principles and understanding of the subject as well as real life situations).

Limits and Derivatives:

Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit. , limsup, liminf . Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions. Mean value theorem.

Integrals: Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts. Definite integrals as a limit of a sum. Fundamental Theorem of Calculus, Basic properties of definite integrals and evaluation of definite integrals. .

Applications of the Integrals:

Applications in finding the area under simple curves, especially lines, areas of circles/parabolas/ellipses, area between the two above said curves. Riemann sums and Riemann integral, Improper Integrals.

Monotonic functions, types of discontinuity, functions of bounded variation, Lebesgue measure, Lebesgue integral. Functions of several variables, directional derivative, partial derivative, derivative as a linear transformation, inverse and implicit function theorems. Metric spaces, compactness, connectedness. Normed linear Spaces. Spaces of continuous functions as examples.

Linear Algebra:

Vector spaces: Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors, scalar triple product.

Linear Inequalities:

Linear inequalities, Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of system of linear inequalities in two variables - graphically.

Subspaces, linear dependence, basis, dimension, algebra of linear transformations.

Matrices & Determinant:
Concept, notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication and scalar multiplication of matrices, simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists.

Determinant of a square matrix (up to 3×3 matrices), properties of determinants, minors, cofactors and applications of determinants in finding the area of a triangle.

Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equation by examples, solving system of linear equations in two or three variables using inverse of a matrix. Rank and determinant of matrices, linear equations. Eigen values and eigen vectors, Cayley-Hamilton theorem.

Matrix representation of linear transformations. Change of basis, canonical forms, diagonal forms, triangular forms, Jordan forms. Inner product spaces, orthonormal basis. Quadratic forms, reduction and classification of quadratic forms

Straight Lines :

Brief recall of 2-D from earlier classes, Shifting of origin. Slope of a line and angle between two lines .Various forms of equations of a line: parallel to axes, point–slope form, slop–intercept form, two–point form, intercept form and normal form, General equation of a line. Equation of family of lines passing through the point of intersection of two lines. Distance of a point from a line.

Conic Sections:
Sections of a cone ; circles , ellipse , parabola, hyperbola ,a point , a straight line and a pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equations of a circle.

Introduction to Three-dimensional Geometry:
Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.

Three-dimensional Geometry:
Direction cosines/ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes, (iii) a line and a plane. Distance of a point from a plane.

UNIT – 2
Complex Numbers and Quadratic Equations:

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve every quadratic equation. Brief description of algebraic properties of complex numbers. Argand plane and polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system. Square-root of a Complex number.

Algebra of complex numbers, the complex plane, polynomials, power series, transcendental functions such as exponential, trigonometric and hyperbolic functions.

Trigonometric Functions:

Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $\sin^2 x + \cos^2 x = 1$, for all x. Signs of trigonometric functions and sketch of their graphs. Expressing $\sin(x\pm y)$ and $\cos(x\pm y)$ in terms of sinx, siny, cosx & cosy.

Identities related to sin 2x, cos 2x, tan 2x, sin 3x, cos 3x and tan 3x. General solution of trigonometric equations of the type $\sin\theta = \sin\alpha$, $\cos\theta = \cos\alpha$ and $\tan\theta = \tan\alpha$.

Analytic functions, Cauchy-Riemann equations. Contour integral, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem, Maximum modulus principle, Schwarz lemma, Open mapping theorem. Taylor series, Laurent series, calculus of residues. Conformal mappings, Mobius transformations.

Algebra:

Permutations & Combinations:
Fundamental principle of counting, Factorial n(n!) Permutations and combinations, derivation of formulae and their connections, simple applications. Pigeon-hole principle, inclusion-exclusion principle.

Fundamental theorem of arithmetic, divisibility in Z, congruences, Chinese Remainder Theorem, Euler's $\emptyset$- function, primitive roots.

Groups, subgroups, normal subgroups, quotient groups, homomorphisms, cyclic groups, permutation groups, Cayley's theorem, class equations, Sylow theorems.
Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domain, principal ideal domain, Euclidean domain.
Polynomial rings and irreducibility criteria. Fields, finite fields, field extensions, Galois Theory. Dense sets, subspace and product topology, separation axioms, connectedness and compactness.

UNIT – 3
Ordinary Differential Equations (ODEs):

Differential Equations:

Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given.

Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

$$\frac{dy}{dx} + py = Q$$

where P and Q are functions of x or constant.

$$\frac{dx}{dy} + px = Q$$

where P and Q are functions of y or constant

Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs.

General theory of homogenous and non-homogeneous linear ODEs, variation of parameters, Sturm-Liouville boundary value problem, Green's function.

Partial Differential Equations (PDEs):
Lagrange and Charpit methods for solving first order PDEs, Cauchy problem for first order PDEs. Classification of second order PDEs, General solution of higher order PDEs with constant coefficients, Method of separation of variables for Laplace, Heat and Wave equations.

Numerical Analysis:
Numerical solutions of algebraic equations, Method of iteration and Newton-Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel methods, Finite differences, Lagrange, Hermite and spline interpolation, Numerical differentiation and integration, Numerical solutions of ODEs using Picard, Euler, modified Euler and Runge-Kutta methods.

Calculus of Variations:
Variation of a functional, Euler-Lagrange equation, Necessary and sufficient conditions for extrema. Variational methods for boundary value problems in ordinary and partial differential equations.

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Linear Integral Equations:
Linear integral equation of the first and second kind of Fredholm and Volterra type, Solutions with separable kernels. Characteristic numbers and eigenfunctions, resolvent kernel.

Classical Mechanics:

Generalized coordinates, Lagrange's equations, Hamilton's canonical equations, Hamilton's principle and principle of least action, Two-dimensional motion of rigid bodies, Euler's dynamical equations for the motion of a rigid body about an axis, theory of small oscillations.

UNIT – 4

Descriptive statistics, exploratory data analysis
Mathematical Reasoning:
Mathematically acceptable statements. Connecting words/phrases–consolidating the understanding of "if and only if (necessary and sufficient) condition", " implies", "and/or", "implied by", "and", "or", there exists" and their use through variety of examples related to real life and Mathematics , Validating the statements involving the connecting words- difference between contradiction, converse and contrapositive.

Statistics:
Measure of dispersion: mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

Probability:
Random experiments: outcomes, sample spaces(set representation). Events: Occurrence of events, 'not', 'and' & 'or' events, exhaustive events, mutually exclusive events. Axiomatic (set theoretic) probability, connections with the theories of earlier classes.

Probability of an event, probability of 'not', 'and' & 'or' events. Multiplication theorem on probability. Conditional probability, independent events, total probability, Baye's theorem, Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution. Sample space, discrete probability, independent events, Bayes theorem. Random variables and distribution functions (univariate and multivariate); expectation and moments. Independent random variables, marginal and conditional distributions. Characteristic functions. Probability inequalities (Tchebyshef, Markov, Jensen). Modes of convergence, weak and strong laws of large numbers, Central Limit theorems .

Markov chains with finite and countable state space, classification of states, limiting behaviour of n-step transition probabilities, stationary distribution, Poisson and birth-and-death processes.

Standard discrete and continuous univariate distributions. sampling distributions, standard errors and asymptotic distributions, distribution of order statistics and range.

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Methods of estimation, properties of estimators, confidence intervals. Tests of hypotheses: most powerful and uniformly most powerful tests, likelihood ratio tests. Analysis of discrete data and chi-square test of goodness of fit. Large sample tests. Simple non-parametric tests for one and two sample problems, rank correlation and test for independence. Elementary Bayesian inference.

Gauss-Markov models, estimability of parameters, best linear unbiased estimators, confidence intervals, tests for linear hypotheses. Analysis of variance and covariance. Fixed, random and mixed effects models. Simple and multiple linear regression. Elementary regression diagnostics. Logistic regression.

Multivariate normal distribution, Wishart distribution and their properties. Distribution of quadratic forms. Inference for parameters, partial and multiple correlation coefficients and related tests. Data reduction techniques: Principle component analysis, Discriminant analysis, Cluster analysis, Canonical correlation.

Simple random sampling, stratified sampling and systematic sampling. Probability proportional to size sampling. Ratio and regression methods.

Completely randomized designs, randomized block designs and Latin-square designs. Connectedness and orthogonality of block designs, BIBD. 2K factorial experiments: confounding and construction.

Series and parallel systems, hazard function and failure rates, censoring and life testing,

Linear Programming Problem:

Introduction, definition of related terminology such as constraints, objectives function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constrains)

Simplex methods, duality. Elementary queuing and inventory models. Steady-state solutions of Markovian queuing models: M/M/1, M/M/1 with limited waiting space, M/M/C, M/M/C with limited waiting space, M/G/1.

COMMERCE

Accounting

Introduction to accounting

Accounting, objectives, advantages and limitations, types of accounting information, uses of accounting information and their needs. Basic accounting terms, accounting concepts, capital and revenue cash basis and accrual basis accounting standards and IFRS.

Accounting Principles, recording of transactions, origin of transactions, source documents, books of original entry

-Journal, cash books and subsidiary books ledger & trail balance, depreciation, provisions & reserves. Accounting for Bills of exchange, rectification of errors, bank reconciliation statement Financial statements of sole propertiership, complete & incomplete records, profit & loss accounts, gross profit, net profit, balance sheet , adjustments in preparation of financial statements.

Financial statements of not for profit organization, receipt & payment account & income and expenditure account & balance sheet.

Introduction to computer & accounting information system

Introduction to operating software , utility software & application software. Stages In automation, accounting for partnership firms ; Admission, retirement, death, & dissolution & cash distribution.

Advance Company Accounts

Accounting for share capital & debentures (share capital, issue & allotment, fore feature, purchase of business, liquidations, valuation of shares amalgamation, absorption & reconstruction, holding company accounts.

Cost & Management Accounting

Ratio analysis , Funds flow analysis , cash flow analysis, Marginal costing & break even analysis, standard costing budgetory control, costing for decision making, responsibility accounting.

Capital structure , financial and operating leverage , cost of capital, capital budgeting , Working capital management, dividend policy , hire purchase, consignment & joint venture.

Balance sheet of a company in the prescribed form with major heading (Schedule VI) Financial analysis.

BUSINESS STUDIES

Nature & Purpose of Business:

Concept & Characteristics

Business profession & Employment-Distinctive Features

Objectives of Business-Economic, Social & Human

Business Risks- Nature & Causes

Role of profit in Business

A brief outline of the evolution of Business Activities In India

STRUCTURE OF BUSINESS

Classifications of Business activities, Industry & Commerce

Industry & Types: Primary & Secondary

E-Commerce- Meaning, Oppurtunities & benefits, Resources required for successful E-Commerce Implementation, Security & safety for Business Transactions.

Outsourcing of Services: Nature, Need & Types, Financial services, Advertising, Customer Support services.

SERVICE SECTOR & BUSINESS

Banking: Types of Banks & Functions of Commercial banks.

Insurance : Principles, Types : Life & General, Fire & marine and Insurance of other Risks, Health Insurance, Fidelity Insurance.

Communication : Postal & Telecommunications

Warehousing : Types & Functions

SOCIAL RESPONSIBILITY OF BUSINESS AND BUSINESS ETHICS

Concept of Social Responsibility.

Case of Social Responsibility & Human Rights.

Responsibility towards Consumers, Government & communit in General.

Business & Environment Protection.

Business Ethics: Concepts & Elements.

FORMS AND FORMATION OF BUSINESS ENTERPRISES

Meaning, Features, Merits & Limitations of following Forms:

Sole Proprietorship

Joint Hindu Business

Partnership: PartnershipDeed (main clauses), Types of Partners

& Partnership formation, Registration.

Co-operative Socities.

Company : Types of Companies- Private,Public & Deemed   public Compan, Privileges of private Company.

Choice of Form of Business Enterprise

Factors to be considered for starting a Business

Scope of setting up a Small Business Enterprises

SECTORAL ORGANISATION OF BUSINESS

Meaning, Features, Merits & Limitations of Following:

-   Private Sector, Public Sector & Joint Sector.

Forms of public Sector Enterprises

Departmental Undertaking
Co-Operative Organisation
Government Company

Global Enterprise (Multi national Company)

Business economics and quantitative methods:

BUSINESS STATISTICS:

Introduction to Statistics:
Statistics: Meaning, Definition; Its Need and Importance in Business, Functions and Distrust of
Statistics. Statistical tools used in economical analysis.
Collection of Data:
Meaning of Data, Sources of Data, types of data, Methods of
Collecting Data, Construction of Questionnaire
Theory of Sampling:
Census and Sampling Methods, Principles of Sampling, Qualities of Good
Sampling, Methods or Techniques of Sampling, need and error of sampling, normal distribution,
hypothesis testing, analysis and interpretation of data, Census of India and National Sample
Survey Organisation
Organisation of Data:
Meaning and types of variables; Frequency Distribution
Presentation of Data:
Tabular Presentation and Diagrammatic Presentation of Data:
(i) Geometric forms (bar Diagrams and pie diagrams)
(ii) Frequency diagrams (histogram, polygon and ogive)
 (iii) Arithmetic line Graphs (time series graph).
Statistical Tools and Interpretation:
Measures of Central Tendency - mean (simple and weighted), median and mode.
Measures of Dispersion - absolute dispersion (range Deciles, Percentile, quartile deviation,
mean deviation and standard Deviation)
Relative dispersion (co-efficient of quartile-deviation, co-efficient of mean deviation, co-
efficient of Variation)
Lorenz Curve: Meaning and its application.

Skewness:

Meaning of Measures of Skewness
Difference between Dispersion & Skewness
Measures of Skewness:
a) Absolute measures
b) Relative Measures & Coefficient of Skewness
(i) Bowley's Coefficient of Skewness
(ii) Kelly's Coefficient of Skewness
(iii) Karl Pearson's Coefficient of Skewness
Introduction to Index Numbers:
Meaning ,types, features and uses of index numbers
Wholesale price index
Consumer price index and index of industrial production
Problems of construction of index numbers
Inflation and index numbers.
Methods of Construction of Index Number, Cost of Living Index Numbers,
Choice of base for Computing Index Numbers, Base Shifting.
Some Mathematical tools used in Economics: Equation of a line, slope of a line, slope of a curve.

CORRELATION & REGRESSION ANALYSIS

Small sample test - T-test, f-test and chi-square test.

Data processing – elements, data entry, data processing and computer applications.

BUSSINESS ECONOMICS:

Nature and uses of business economics: Concept of profit and wealth maximisation ,

Definition, Characteristics of Managerial Economics Difference between Managerial Economics and Economics- Its Scope, Uses and Role & Responsibility of Managerial Economics.

Microeconomics
Meaning of microeconomics and macroeconomics
What is an economy
Central problems of an economy , what, how and for whom to produce.
Concepts of production possibility frontier and opportunity cost.
Consumer Equilibrium and Demand
Consumer's equilibrium – meaning of utility, marginal utility, law of diminishing marginal utility, law of equi.-marginal utility , conditions of consumer's equilibrium using marginal utility analysis.
Indifference curve analysis of consumer's equilibrium-the consumer's budget (budget set and budget line), preferences of the consumer (indifference curve, indifference map) and conditions of consumer's equilibrium (one and two commodity cases) .

Demand, market demand, determinants of demand,law of demand, demand schedule, demand curve, movement along and shifts in the demand curve; price elasticity of demand - factors affecting price elasticity of demand; measurement of price elasticity of demand – (a) percentage-change method and (b) geometric method (linear demand curve); relationship between price elasticity of demand and total expenditure.

Producer Behaviour and Supply
Production function: returns to factor and returns to scale;
Total Product, Average Product and Marginal Product.
Returns to a Factor.
Cost and Revenue: Short run costs - total cost, total fixed cost, total variable cost; Average fixed cost, average variable cost and marginal cost-meaning and their relationship.
Revenue - total, average and marginal revenue.
Producer's equilibrium-meaning and its conditions in terms of marginal revenue-marginal cost.
Supply, market supply, determinants of supply, law of supply, supply schedule, supply curve, movements along and shifts in supply curve, price elasticity of supply; measurement of price elasticity of supply – (a) percentage change method and (b) geometric method.

Forms of Market and Price Determination
Forms of Market-Perfect Competition, Monopoly, Monopolistic Competition-Their Meaning and Features, Price Determination in different ,market situations: Perfect competition, monopolistic competition , monopoly ,price discrimination and oligopoly, pricing strategies.

Macroeconomics:
NATIONAL INCOME AND RELATED AGGREGATES.
Basic Concepts and Measurement of National Income.
(i) Macro Economics-Meaning, Circular Flow of Income, Concepts of GDP, GNP, NDP, NNP, (At Market Price and Factor Cost) National Disposable Income (Gross and Net) Private Income, Personal Income and Personal Disposable Income.
(ii) Measurement of National Income-Value Added Method, Income Method and Expenditure Method.

Money and Banking:
(i) Money- Meaning, Evolution and Functions. Supply of money – Currency held by the public and net demand deposits held by commercial banks. Money creation by the commercial banking system.
(ii) Central Bank- Meaning and Functions
(iii) Commercial Banks- Meaning and Functions
(iv) Recent Significant Reforms and Issue in Indian Banking System, Privatization and Modernization.

Government budget and Economy:
(i) Government Budget- Meaning and its Components, Objectives of Government Budget.
(ii) Classification of Receipts- Revenue and Capital
(iii) Classification of Expenditure-Revenue and Capital, Plan and Non-Plan and Developmental and Non-Developmental.
(iv) Balanced Budget-Surplus Budget and Deficit Budget; Meaning and Implications.
(v) Revenue Deficit, Fiscal Deficit and Primary Deficit; Meaning and Implications; Measures to correct different Deficits. Fiscal Policy and its role

Balance of Trade and Balance of payments:
(i) Foreign Exchange Rate- Meaning (Flexible and Fixed and managed floating) Merits and Demerits, Determination in a free market.
(ii) Balance of Payment Accounts-Meaning and Components,
 A Brief Analysis about recent Exchange Rate issues.

COMPUTER SCIENCE AND APPLICATION

1. Computer Fundamentals:

History of Computers, Block diagram of computer & detailed significance of each part, Number Systems, I/O devices: Keyboard, Hard disk, CD-ROM, DVD, Plotters, Scanners, mouse, Printers, VDU. Primary & Secondary memories.

Introduction to Operating Systems & its functions. Definition of Simple batch processing, multiprogramming, multiprocessing, real-time, time-sharing systems, Concept of Spooling, Applications of IT, MSOffice: Word, excel, Power point, Access etc.

2. Computer Arithmetic:-

Boolean Algebra: Introduction to Boolean Algebra, Truth Tables, The Principle of Duality, Theorems of Boolean Algebra, Idempotent law, Commutative law, Associative law, Distributive law, Absorption law, Demorgan's law and its applications, Boolean Functions, Karnaugh Map.

Logic Gates- And Gate, OR Gate, NOT Gate, NAND Gate, NOR Gate. Converting Expressions to Logic Circuits, The Universal NAND Gate, The Universal NOR Gate,

Exclusive Or and Equivalence Functions Design combination circuits, Design of Half Adder, Design of Full Adder, Encoder Decoder.

3. Computer Graphics:

Video Display Devices Refresh cathode -ray tube, raster scan displays, random scan displays, color CRT-monitors, direct view storage tube, flat-panel displays; 3-D viewing devices, raster scan systems, random scan systems, graphics monitors and workstations.

4. Digital Circuit & Logic Gates:

Introduction: Overview of number system and codes. Elements and functions of digital Logic gates, Gate propagation delay time, logic gate applications.

Boolean operations, Combinational logical circuits: design of Binary Adder-Serial, Parallel, Carry look ahead type. Sequential logic circuits: Flip flop: Counters: Design of asynchronous and

synchronous, up down and programmable counters. Registers: shift registers, various types and their applications. Detection and correction codes, detecting and correcting an error.

5. Computer System Architecture:

Computer Organization & Design: Instruction codes, op-codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory reference instructions, CPU: Stack Organization, Instruction format, Addressing Formats. Transfer of Information among I/O devices, CPU, Memory and I/O ports.

Memory System: Storage technologies, Memory hierarchy, Memory mapping, Main memory and Auxiliary memory, Associative and Cache memory introductory study of 8-bit Microprocessor.

6. Computer Networks:

Data communications concepts: Digital and analog parallel and serial synchronous and Asynchronous, simplex, half duplex, full duplex, multiplexing.

Communication channels: Wired transmissions: Telephone lines, leased lines, switch line, coaxial cables-base band, broadband, optical fiber transmission.

Wireless transmission: Microwave transmission, infrared transmission, laser Transmission, radio transmission, and satellite transmission. Communication switching techniques; Circuit switching, message switching, packet Switching

Network reference models; Network topologies, OSI references model, TCP/IP Reference model, comparison of OSI and TCI reference model.

Data link layer design issue: Services provided to the network layer, framing, error control, flow control HDLC, SDLC, data link layer in the internet (SLIP, PPP). MAC sub layer: CSMA/CD, IEEE standards, FDM, TDM, CDMA. The Network

Layer: Design Issues, Routing Algorithms: Optimality principled, shortest path routing, Concept of Internet Working.

7. Data Structures:

Introduction to Data Structure: Basic concept of data, Problem analysis , algorithm complexity, Big O notation and time space trade off.

Stacks & Queues: Basics of stacks and queues, Recursion, Polish notation, circular Queues, priority Queues.

Linked Lists: Single linked list, circular linked list, doubly linked list and dynamic storage management, generalized list, Garbage Collection.

Trees: Definition & Concepts, Basic trees, Binary tree representations, threaded storage representation, binary tree traversals, and application of trees.

Searching and sorting: use of various data structures for searching and sorting, linear and binary search, insertion sort, selection sort, merge sort, bubble sort, quick sort, Heap sort.

8. Programming in C Language and Oops Concepts:

Introduction, Features of C language, Character Set, Structure of a C Program: Header Files, Preprocessor statement, directives, Global. Declaration (main(), Braces, Declaration, Statements), Compiling and execution of C program. Use of Editor. Function: Built in Function, user defined Function. Formatted I/O function [scanf() & printf() function]

Starting with C programming: Installing Turbo C, Compiling the program and executing the program. Constant, Varibales & DataTypes, Tokens, Operators and Expression.

Control Flow: Introduction: Branching, Looping, Jumping

Arrays: Introduction, Declaring and initialization of array: Initializing arrays, Two dimensional array, Multidimensional Arrays. String, Structure & Union, Pointer, Functions.

C++ Programming: Oop Concepts, Classes, Objects, Initialization, Inheritance, Polymorphism, Constructer, Destructors, Exception handling.

9. Java Scripting:

Introduction: Internet Architecture board, understanding the internet. Concept: Working, Surfing and security on the internet. Internet protocols Internet addressing, internet routing protocols internet message protocol, internet group management protocols, internet mail protocol.

Internet applications: E-mail, multi cost backbone, net news. Web: World Wide Web advantages of web, web terminology, web access using web browser, locating information on the web.

Introduction to Java: Applets, different b/w Java & C++, working with Java objects: Encapsulation, inheritance & polymorphism, constructors. Garbage collection & finalizes, data types, modifies & expressions, array & flow control statements.

Exception handling threads, event handling, network programming & Java virtual machines, Java & databases.

10. Visual Basic:

Mastering the IDE, working with forms, selecting and using controls, object programming with VB, adding Scripting & Scripting objects.

11. Operating System:

Introduction to Operating System, its need and Operating System services; Operating System classification -single user, multi-user, simple batch processing, Multiprogramming, Multitasking, Parallel system, Distributed system, Real time system. Process Management: Process Concept, Process scheduling, Overview of Inter-Process communication,

Deadlocks: Deadlock Characteristics, Prevention, Avoidance, Detection and Recovery, critical section, synchronization hardware, semaphores, combined approach to deadlock handling.

12. System Software:

Introduction to software processors; elements of assembly language programming; assembly scheme, single pass and two pass assembler; general design procedure of a two pass assembler.

13. **Data Base Management System:**

An overview of the DBMS: Concept of database system, Database Administrator and his responsibilities. Physical and Logical data independence.

Three level Architecture of database system: the external level, conceptual level and the internal level.

Introduction to Data Models: Entity Relationship Model, Hierarchical, Network and Relational Model. Comparison of Network, Hierarchical and Relational Model.

Relational data model: Relational database, SQL ,SQL normalization.

Database protection: Recovery, concurrency, security, integrity and control.

Distribute database: Structure of distributed database, design of distributed databases.

14. **Software Engineering:**

Software: Characteristics, Components, Applications, Software Process Models: Waterfall, Spiral, Prototyping, Fourth Generation Techniques, Concepts of Project. Management, Role of Metrics & Measurements. S/W Project Planning: Objectives,

Decomposition techniques: S/W Sizing, Problem- based estimation, Process based estimation, Cost Estimation Models: COCOMO Model, The S/W Equation,

System Analysis: Principles of Structured Analysis, Requirement analysis, DFD, Entity Relationship diagram, Data dictionary.

S/W Design: Objectives, Principles, Concepts, Design methodologies: Data design, Architectural design, procedural design, Object -oriented concepts

Testing fundamentals: Objectives, principles, testability, Test cases: White box & Black box testing,

Testing strategies: verification & validation, unit test, integration testing, validation testing, system testing.

15. **Operation Research:**

Origin & development of O.R., Nature & Characteristics features of O.R., Models & Modeling in Operation Research. Methodology of O.R., General methods for solving O.R. Models, O.R. & Decision making, Application, Use & Limitations of O.R.

16. **Artificial Intelligence:**

Introduction to AI: Definitions, AI problems, the underlying assumption, and AI Techniques, Level of Model. Problems, Problem Space and Search: defining the problem as a state space search, Production System, Problem Characteristics.

PHYSICAL   EDUCATION

Part-A

Concept of Physical Education

1. Meaning and definition of of Physical Education, its aim and objectives
2. Need and importance of Physical Education
3. Misconceptions about Physical Education & its relevance in inter Disciplinary Context

Physiological aspects of physical education

1. Warning up General & Specific & Its physiological basis
2. Effects of exercise on Muscular & Digestive Systems
3. Effects of exercise on Respiratory & Circulatory Systems

Yoga

1. Meaning & importance of yoga
2. Yoga as an Indian heritage
3. Elements of yoga in sports

Nutrition

1. Balanced diet –carbohydrates, fats , proteins, vitamin & water

Personal hygiene

I.   meaning of personal hygiene

II. importance of personal hygiene
III. care of eyes ,ears, nose, skin, hands, teeth& hair
IV. role of exercise , rest, sleep, & relaxation maintaining health

Sports injuries

I. common sports injuries –sprain, strain, superficial injuries, muscle pull
II. causes & prevention of sports injuries

First Aid

I. introduction & meaning of first aid
II. principles of first aid
III. qualities of first aider
IV. emergency care of drowning, burns , dislocation, fracture and electric shock

Psychological Foundation

1. understanding the nature of learning, cognitive learning, perception applied practice, critical and creative thinking
2. understanding the psychomotor learning-learning physical skill , motor learning principles law of learning and its applications to situations of playground
3. understanding affective learning attitude ,appreciation, values
4. understanding motivational techniques-extrinsic and intrinsic motivation, enhancing learning experience, classroom managements fitness level , environment, public relations
5. personality ,body concept and physical activities
6. motivation and psycho-metric approach in coaching
7. physical activities and psychological development handicapped
8. reflexes and conditioned reflexes

Sociological Foundation

1. Social nature and learning of man, social change, social value, social groups
2. Sociological aspects of physical education
3. Social institutions and their influence
4. National integration through physical education
5. Leadership and physical education
6. Social recognition and physical education
7. Influence of the group on individual and vise versa

8. Competition and co-operation
9. Socioeconomic status & physical education

Historical Foundation

1. Physical education in Ancient and modern india
2. Physical education in ancient Greece
3. Physical education in ancient Rome
4. Physical education in Sparta and Athens
5. Physical education in RSSR
6. Physical education in Europe
   Germany, Spain, France, Great Britain, Sweden, Denmark
7. Physical education in China and Japan
8. Impact of contribution of Ancient physical education on modern physical education
9. Early beginning and first civilizations

Major Sports Events

1. Olympics Games, winter Olympics, para Olympics
2. Asian Games
3. SAF Games
4. Common Wealth Games
5. World Athletics meet and indoor Athletics Meet
6. World cup Tournament

Health Education

1. Meaning and definition of health education
2. Meaning and concept of health
3. Factors influencing-Health –Exercise, diet, climate, age, surrounding , occupation and heredity
4. Guiding principles of Health and Health Education

School Health Programme

1. School Hygiene –school Building ventilation and light ,seating arrangement , water supply facilities and play grounds
2. School health programme –health instruction ,health supervision, health services and medical examination of students

Officiating and coaching

1. Need and scope of officiating in physical education
   a) Importance and principles in officiating
2. Relation of officials with players and coaches.
   a) effect of spectator on officials
   b) Qualities and duties of officials
3. before during and after in different games and Athletics

Recreation

1. recreation : Definition ,its importance, characteristics and misconception
2. importance of recreation
3. leadership of recreation: meaning and objectives of recreation leadership
   -Types and functions of recreation leaders
   -Qualifications, Qualities and professional traning

PART- B

Following sub topics relate to any one Game/Sports of choice of student out of these disciplines: Badminton, Handball, Hockey, Kabaddi, Kho-Kho, Skating, Swimming & Teakwondo, Athletics, Cricket, Football, Judo, Table Tennis, Tennis & Volleyball

1. history of the Game/Sports
2. latest general rules of the Game/Sports
3. measurement of play fields and specifications of related sports equipments
4. important tournaments and venues
5. fundamental skills of the Game/Sports
6. sports awards

ਪੰਜਾਬੀ

ਭਾਗ ਪਹਿਲਾ:–

ਪੰਜਾਬੀ ਭਾਸ਼ਾ-ਸਰੂਪ ਤੇ ਪ੍ਰਵਿਰਤੀਆਂ।

ਭਾਰਤੀ ਆਰਿਆਈ ਭਾਸਾ ਪਰਿਵਾਰ ਅਤੇ ਪੰਜਾਬੀ ਭਾਸ਼ਾ।

ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀ ਉਤਪੱਤੀ ਅਤੇ ਵਿਕਾਸ-ਪੜਾਅ।

ਪੰਜਾਬੀ ਦੀ ਉਪ ਭਾਸਾਵਾਂ।

ਪੰਜਾਬੀ ਅਤੇ ਹੋਰ ਭਾਸ਼ਾਵਾਂ-ਸੰਸਕ੍ਰਿਤ, ਫਾਰਸੀ, ਅੰਗਰੇਜੀ, ਹਿੰਦੀ, ਉਰਦੂ।

ਪੰਜਾਬੀ ਧੁਨੀ ਵਿਗਿਆਨ-ਸਵਰ, ਵਿਅੰਜਨ, ਅੱਖਰ, ਟੋਨ, ਬਲ, ਤਾਨ, ਸੰਗਮ

ਪੰਜਾਬੀ ਰੂਪ ਵਿਗਿਆਨ-ਰੂਪ-ਤੱਤ, ਉਪਸਰਗ, ਪਰਸਰਗ, ਸ਼ਬਦ ਰਚਨਾ ਅਤੇ ਸ਼ਬਦਾਵਲੀ।

ਪੰਜਾਬੀ ਅਰਥ ਵਿਗਿਆਨ

ਪੰਜਾਬੀ ਵਾਕ ਵਿਗਿਆਨ

ਗੁਰਮੁਖੀ ਲਿਪੀ- ਨਿਕਾਸ ਤੇ ਵਿਕਾਸ, ਪ੍ਰਾਚੀਨਤਾ, ਪੰਜਾਬੀ ਲਈ ਉਚਿੱਤਤਾ, ਪੰਜਾਬੀ ਕੋਸ਼ਕਾਰੀ, ਵਿਆਕਰਨ ਰਚਨਾ ਅਤੇ ਅਨੁਵਾਦ ਕਾਰਜ।

ਭਾਗ ਦੂਜਾ:

ਪੰਜਾਬੀ ਸਾਹਿਤ ਦੀ ਇਤਿਹਾਸਕਾਰੀ:–

ਪੰਜਾਬੀ ਸਾਹਿਤ ਦੀ ਇਤਿਹਾਸਕਾਰੀ ਦਾ ਸਮੀਖਿਆਤਮਕ ਅਧਿਐਨ

ਪੰਜਾਬੀ ਸਾਹਿਤ ਦੀ ਇਤਿਹਾਸਕਾਰੀ, ਸਥਿਤੀ ਤੇ ਸਮੱਸਿਆਵਾਂ

ਪੰਜਾਬੀ ਸਾਹਿਤ ਦੀ ਕਾਲ ਵੰਡ, ਪੰਜਾਬੀ ਸਾਹਿਤ ਦੇ ਇਤਿਹਾਸਾਂ ਦਾ ਵਰਗੀਕਰਨ।

ਸਾਹਿਤਕ ਲਹਿਰਾਂ:– ਰਹੱਸਵਾਦ, ਅਦਰਸ਼ਵਾਦ, ਰੁਮਾਂਸਵਾਦ, ਯਥਾਰਥਵਾਦ, ਪ੍ਰਗਤੀਵਾਦ, ਪ੍ਰਯੋਗਵਾਦ, ਅਸਤਿਤਵਾਦ, ਜੁਝਾਰਵਾਦ।

ਭਾਗ ਤੀਜਾ:-

ਪੰਜਾਬੀ ਲੋਕ ਸਹਿਤ:-

ਲੋਕ ਸਹਿਤ:- **ਪ੍ਰਿਭਾਸ਼ਾ**, ਸਰੂਪ ਅਤੇ ਵਰਗੀਕਰਨ, ਸਾਹਿਤ ਅਤੇ ਲੋਕ ਸਾਹਿਤ।

ਲੋਕ ਗੀਤ- ਸੰਸਕਾਰਾਂ, ਰੁੱਤਾਂ, ਦਿਨ-ਦਿਹਾਰਾਂ, ਪੂਜਾ ਅਤੇ ਦੇਵੀ ਦੇਵਤਿਆਂ ਬਾਰੇ ਗੀਤ, ਕਾਰਜ ਗੀਤ, ਪਿਆਰ ਗੀਤ, ਸੂਰਮਗਤੀ ਗੀਤ, ਨਰਿਤ ਗੀਤ, ਬੱਚਿਆਂ ਦੇ ਗੀਤ, ਪੇਸ਼ਾਵਰ ਜਾਤੀਆਂ ਦੇ ਗੀਤ।

ਲੋਕ ਕਾਵਿ:- ਰੂਪ, ਸੱਦ, ਬਾਰਾਮਾਹ, ਘੋੜੀਆਂ, ਅਲਾਹੁਣੀਆਂ, ਮਾਹੀਆ, ਟੱਪੇ , ਬੋਲੀਆਂ, ਲੋਰੀਆਂ, ਢੋਲੇ, ਲੋਕ ਵਾਰ।

ਲੋਕ ਕਥਾਵਾਂ:- ਮਿੱਥ ਕਥਾਵਾਂ, ਦੰਤ ਕਥਾਵਾਂ, ਪਰੀ ਕਥਾਵਾਂ, ਪ੍ਰੀਤ ਕਥਾਵਾਂ, ਜਨੌਰ ਕਥਾਵਾਂ ਆਦਿ।

ਫੁੱਟਕਲ:- ਲੋਕ ਗਾਥਾ, ਅਖਾਣ, ਬੁਝਾਰਤਾਂ, ਮੁਹਾਵਰੇ।

ਭਾਗ ਚੌਥਾ:-

ਪੰਜਾਬੀ ਲੋਕਯਾਨ ਅਤੇ ਪੰਜਾਬੀ ਸੱਭਿਆਚਾਰ:-

ਪੰਜਾਬੀ ਦੀ ਲੋਕਯਾਨਿਕ ਸਮੱਗਰੀ ਦੇ ਵਿਭਿੰਨ ਰੂਪ ਅਤੇ ਵਰਗੀਕਰਨ

ਪੰਜਾਬੀ ਲੋਕ ਵਿਸ਼ਵਾਸ ਅਤੇ ਅਨੁਸਠਾਨ:- ਵਹਿਮ ਭਰਗ, ਜੰਤਰ ਮੰਤਰ, ਜਾਦੂ ਟੂਣੇ, ਟੋਟਕੇ, ਤਵੀਜ, ਸਗਨ ਅਪਸਗਨ, ਪੁਨ ਪਾਪ, ਸੰਸਕਾਰ ਅਤੇ ਗੀਤੀ ਰਿਵਾਜ (ਜਨਮ, ਵਿਆਹ ਅਤੇ ਮੌਤ ਨਾਲ ਸਬੰਧਤ)

ਵਰਤ ਤੇ ਪੂਜਾ ਵਿਧੀਆਂ, ਕਰਮਕਾਂਡ, ਸਾਕਾਦਾਰੀ,

ਪੰਜਾਬ ਦੀਆਂ ਲੋਕ ਕਲਾਵਾਂ।

ਪੰਜਾਬ ਦਾ ਲੋਕ ਸੰਗੀਤ।

ਪੰਜਾਬ ਦਾ ਲੋਕ ਨਾਟ।

ਪੰਜਾਬ ਦੇ ਲੋਕ ਨਾਚ।

ਪੰਜਾਬ ਦੀ ਲੋਕ ਮੂਰਤੀਕਾਰੀ ਅਤੇ ਲੋਕ ਚਿੱਤਰਕਾਰੀ।

ਪੰਜਾਬ ਦੇ ਲੋਕ ਧੰਦੇ, ਲੋਕ ਗਹਿਣੇ, ਲੋਕ ਪਹਿਰਾਵਾ, ਲੋਕ ਖੇਡਾਂ ਅਤੇ ਤਮਾਸ਼ੇ।

ਭਾਗ ਪੰਜਵਾਂ:-

ਪੰਜਾਬੀ ਸੂਫ਼ੀ ਕਾਵਿ :-

ਨਿਕਾਸ ਅਤੇ ਵਿਕਾਸ ਪੜਾਅ।

ਸੂਫ਼ੀ ਮੱਤ:-

ਸਿਧਾਂਤ ਅਤੇ ਵਿਕਾਸ।

ਪ੍ਰਮੁੱਖ ਸੂਫ਼ੀ ਕਵੀ:–

ਬਾਬਾ ਫ਼ਰੀਦ, ਸਾਹ ਹੁਸੈਨ, ਬੁੱਲੇ ਸਾਹ, ਸੁਲਤਾਨ ਬਾਹੂ, ਗੁਲਾਮ ਫ਼ਰੀਦ।

ਪੰਜਾਬੀ ਸੂਫ਼ੀ ਕਾਵਿ ਦੀਆਂ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ ਅਤੇ ਵਿਹਾਰਕ ਅਧਿਐਨ:–

ਭਾਗ ਛੇਵਾਂ:–

ਗੁਰਮਤਿ ਕਾਵਿ ਧਾਰਾ:–

ਆਰੰਭ, ਵਿਕਾਸ ਅਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ

ਗੁਰੂ ਗ੍ਰੰਥ ਸਾਹਿਬ:–ਸੰਪਾਦਨਾ ਅਤੇ ਸਾਹਿਤ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ

ਪ੍ਰਮੁੱਖ ਬਾਣੀਕਾਰ:–

ਸ੍ਰੀ ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਜੀ, ਸ੍ਰੀ ਗੁਰੂ ਅੰਗਦ ਦੇਵ ਜੀ, ਸ੍ਰੀ ਗੁਰੂ ਅਮਰ ਦਾਸ ਜੀ, ਸ੍ਰੀ ਗੁਰੂ ਰਾਮਦਾਸ ਜੀ, ਸ੍ਰੀ ਗੁਰੂ ਅਰਜਨ ਦੇਵੀ ਜੀ, ਸ੍ਰੀ ਗੁਰੂ ਤੇਗ ਬਹਾਦਰ ਜੀ।

ਭਗਤ ਕਵੀ:–

ਭਗਤ ਰਵੀਦਾਸ, ਭਗਤ ਨਾਮਦੇਵ, ਭਗਤ ਕਬੀਰ ਆਦਿ।

ਗੁਰੁਬਾਣੀ ਦਾ ਕਾਵਿ ਸ਼ਾਸਤਰ ਅਤੇ ਪ੍ਰਭਾਵ।

ਵਾਰਾਂ ਭਾਈ ਗੁਰਦਾਸ:–

ਵਿਹਾਰਿਕ ਅਧਿਐਨ।

ਭਾਗ ਸੱਤਵਾਂ:–

ਪੰਜਾਬੀ ਕਿੱਸਾ ਕਾਵ ਅਤੇ ਵੀਰ ਕਾਵ:–

ਨਿਕਾਸ, ਵਿਕਾਸ ਅਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।

ਪ੍ਰਮੁੱਖ ਕਿੱਸਾਕਾਰ:–

ਦਮੋਦਰ, ਪੀਲੂ, ਵਾਰਸ, ਹਾਸਮ, ਕਾਦਰਯਾਰ।

ਪ੍ਰਮੁੱਖ ਵਾਰਕਾਰ:–

ਸ੍ਰੀ ਗੁਰੂ ਗੋਬਿੰਦ ਸਿੰਘ, ਨਜਾਬਤ।

ਪੰਜਾਬੀ ਜੰਗਨਾਮਾ:– ਸਾਹਮੁਹੰਮਦ।

ਵਿਹਾਰਕ ਅਧਿਐਨ।

ਭਾਗ ਅੱਠਵਾਂ:

ਪੰਜਾਬੀ ਵਾਰਤਕ :–

ਮੱਧਕਾਲੀਨ ਵਾਰਤਕ :–ਜਨਮ ਸਾਖੀ ਪਰੰਪਰਾ: ਪੁਰਾਤਨ ਜਨਮ ਸਾਖੀ, ਆਦਿ ਸਾਖੀਆਂ, ਮਿਹਰਵਾਨ ਵਾਲੀ ਜਨਮਸਾਖੀ, ਭਾਈ ਬਾਲਾ, ਗਿਆਨ ਰਤਨਾਵਲੀ, ਗੁਰਬਿਲਾਸ, ਗੋਸਟੀਆਂ, ਪਰਚੀਆਂ, ਰਹਿਤਨਾਮੇ ਅਤੇ ਟੀਕੇ।

ਆਧੁਨਿਕ ਵਾਰਤਕ:– ਨਿਬੰਧ, ਜੀਵਨੀ, ਸਵੈ ਜੀਵਨੀ, ਸਫਰਨਾਮਾ, ਰੇਖਾ ਚਿੱਤਰ, ਸੰਸਮਰਣ।

ਪ੍ਰਮੁੱਖ ਵਾਰਤਾਕਾਰ:–   !

ਭਾਈ ਵੀਰ ਸਿੰਘ, ਬਲਬੀਰ ਸਿੰਘ, ਪੂਰਨ ਸਿੰਘ, ਕਪੂਰ ਸਿੰਘ, ਸਾਹਿਬ ਸਿੰਘ, ਤੇਜਾ ਸਿੰਘ, ਗੁਰਬਖ਼ਸ਼ ਸਿੰਘ ਪ੍ਰੀਤਲੜੀ, ਬਲਰਾਜ ਸਾਹਨੀ।

ਪੰਜਾਬੀ ਗੱਦ ਸੈਲੀ ਦਾ ਵਿਕਾਸ:–

ਵਿਹਾਰਕ ਅਧਿਐਨ।

ਭਾਗ ਨੌਂ:–

ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਕਾਵ:–

ਆਧੁਨਿਕਤਾ ਅਤੇ ਆਧੁਨਿਕ ਬੋਧ।

ਅਰੰਭ, ਵਿਕਾਸ ਅਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।

ਪ੍ਰਮੁੱਖ ਕਵੀ: ਭਾਈ ਵੀਰ ਸਿੰਘ, ਪੂਰਨ ਸਿੰਘ, ਧੀਨ ਰਾਮ ਚਾਤ੍ਰਿਕ, ਪ੍ਰੋ: ਮੋਹਨ ਸਿੰਘ, ਅਮ੍ਰਿਤਾ ਪ੍ਰੀਤਮ, ਬਾਵਾ ਬਲਵੰਤ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਫੀਰ, ਹਰਭਜਨ ਸਿੰਘ, ਜਸਵੰਤ ਸਿੰਘ ਨੇਕੀ, ਸ਼ਿਵ ਕੁਮਾਰ, ਪਾਸ਼, ਸੁਰਜੀਤ ਪਾਤਰ।

ਵਿਹਾਰਿਕ ਅਧਿਐਨ।

ਭਾਗ ਦੱਸ:

ਪੰਜਾਬੀ ਗਲਪ:–

ਨਾਵਲ: ਅਰੰਭ ਵਿਕਾਸ ਅਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ

ਪ੍ਰਮੁੱਖ ਨਾਵਲਕਾਰ :   ਨਾਨਕ ਸਿੰਘ, ਸਸ ਨਰੂਲਾ, ਜਸਵੰਤ ਸਿੰਘ ਕੰਵਲ, ਨਰਿੰਦਪਾਲ ਸਿੰਘ, ਗੁਰਦਿਆਲ ਸਿੰਘ, ਰਾਮ ਸਰੂਪ ਅਣਖੀ।

ਕਹਾਣੀ ਅਤੇ ਨਿੱਕੀ ਕਹਾਣੀ:– ਆਰੰਭ, ਵਿਕਾਰ ਅਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ

ਪ੍ਰਮੁੱਖ ਕਹਾਣੀਕਾਰ: ਸੁਜਾਨ ਸਿੰਘ, ਕਰਤਾਰ ਸਿੰਘ ਦੁੱਗਲ, ਕੁਲਵੰਤ ਸਿੰਘ ਵਿਰਕ, ਅਜੀਤ ਕੌਰ, ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼।

ਪੰਜਾਬੀ ਕਹਾਣੀ ਵਿੱਚ ਨਵੇਂ ਝੁਕਾਅ ਅਤੇ ਵਿਸੇਸ ਪ੍ਰਪਤੀਆਂ।

ਭਾਗ ਗਿਆਰਾਂ:

ਪੰਜਾਬੀ ਨਾਟਕ ਅਤੇ ਇਕਾਂਗੀ:–

ਆਰੰਭ ਵਿਕਾਸ ਅਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ।

ਪ੍ਰਮੁੱਖ ਨਾਟਕਕਾਰ ਅਤੇ ਇਕਾਂਗੀਕਾਰ:-

ਇਸ਼ਵਰ ਚੰਦਰ ਨੰਦਾ, ਸੰਤ ਸਿੰਘ ਸੇਖੋਂ, ਹਰਚਰਨ ਸਿੰਘ, ਬਲਵੰਤ ਗਾਰਗੀ, ਗੁਰਚਰਨ ਸਿੰਘ ਜਸੂਜਾ, ਸੁਰਜੀਤ ਸਿੰਘ ਸੇਠੀ, ਗੁਰਦਿਆਨ ਸਿੰਘ ਖੋਸਲਾ, ਕਪੂਰ ਸਿੰਘ ਘੁੰਮਣ, ਚਰਨ ਦਾਸ ਸਿੱਧੂ।

ਪੰਜਾਬ ਰੰਗਮੰਚ:-

ਅਰੰਭ ਵਿਕਾਸ, ਸਮੱਸਿਆਵਾਂ ਅਤੇ ਨਵੀਨਤਮ ਸ਼ੈਲੀਆਂ ਅਤੇ ਜੁਗਤਾਂ

ਭਾਗ ਬਾਰਾਂ:-

ਪੰਜਾਬ ਅਲੋਚਨਾ:

ਅਰੰਭ ਅਤੇ ਵਿਕਾਸ

ਪੰਜਾਬੀ ਅਲੋਚਨਾ ਦੀਆਂ ਪ੍ਰਾਪਤੀਆਂ ਅਤੇ ਨਵੀਨ ਸੰਭਾਵਨਾਵਾਂ

ਪ੍ਰਮੁੱਖ ਪੰਜਾਬੀ ਅਲੋਚਕ: ਪ੍ਰੋ ਕਿਸਨ ਸਿੰਘ, ਸੰਤ ਸਿੰਘ ਸੇਖੋਂ , ਹਰਭਜਨ ਸਿੰਘ, ਅਤਰ ਸਿੰਘ।